

REMARKS

Claims 1, 7, 8, 15 and 18 have been amended. Claims 5, 6, 12 and 13 have been canceled.

The Examiner has rejected applicants' claims 1, 2, 4, 5 and 7 under 35 USC § 102(b) as anticipated by the White (US Patent No. 624,142) patent. Claims 1-7 have similarly been rejected under 35 USC § 102(b) based on the Nakagishi (US Patent No. 6,424,068) patent. Finally, claims 8-18 have been rejected under 35 U.S.C. § 103(a) as being obvious over the Prior Art disclosed in applicant's FIGS 6A and 6B in view of the Nakagishi patent. With respect to applicant's claims, as amended, these rejections are respectfully traversed.

Applicant's independent claims 1, 7, 8 and 18 have been amended to better define applicant's invention. More particularly, applicant's amended claim 1 recites a driver, comprising: a rotor to which a magnet is fixed, adapted to be rotated with an axis portion as a center; a first bearing for supporting one end of the axis portion of the rotor; a second bearing for supporting the other end of the axis portion of the rotor; and a yoke arranged in a position shifted in a thrust direction with respect to the magnet, wherein the axis portion of the rotor is biased in an axial direction of the rotor and in a radial direction of the rotor by a magnetic force acting between the yoke and the magnet, and a fitted portion of the first bearing into which the axis portion is fitted is formed into a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction. Applicant's claim 8 has been similarly amended.

Amended claim 7, on the other hand, has been amended to recite a driver, comprising: a rotor to which a magnet is fixed, adapted to be rotated with an axis portion as a center; a first bearing for supporting one end of the axis portion of the rotor; a second bearing for supporting the other end of the axis portion of the rotor; and a yoke arranged in a position shifted in a thrust direction with respect to the magnet, wherein the axis portion of the rotor is biased in an axial direction of the rotor and in a radial direction of the rotor by a magnetic force acting between the yoke and the magnet, and a fitting portion of the axis portion which is fitted into the first bearing is formed into a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction. Applicant's claim 18 has been similarly amended.

Applicant's invention is directed to a driver in which a rotor to which a magnet is fixed is surrounded by a yoke. In particular, since a magnetic force for attracting toward the yoke acts on the rotor, the axis portion of the rotor is shifted or biased along one direction within a bearing for supporting the axis portion. In accordance with the rotational position of the rotor, the direction along which a force attracting the rotor toward the yoke changes, and, therefore, the central position of the axis portion of the rotor is not stabilized and a vibration of the rotation axis occurs. If the clearance between the axis portion of the rotor and the bearing is decreased to prevent the vibration of the rotation axis, an increment of frictional force and a decrement of driving efficiency not only occur, but there is also unwanted heat generation and noise.

Applicant's invention as recited in applicant's above claims avoids this problem by utilizing the following: 1) a fitted portion of the bearing to which the axis portion of the rotor is fitted or a fitting portion of the axis portion of the rotor which is fitted into the bearing is formed into a tapered shape, 2) the magnet fixed to the rotor is located with a shift in the thrust direction of the axis portion of the rotor with respect to the yoke, and 3) the rotor is biased along the axial direction by the magnetic force, so as to prevent the rotation axis or axis portion of the rotor from generating vibration in the radial direction by the magnetic force. Accordingly, in the present invention, the central position of the axis portion of the rotor is stabilized by using only necessary elements used for constructing the driver, without the addition of a specific element or a specific working, except for changing the shape of the fitted portion of the bearing or the fitting portion of the axis portion of the rotor.

Such constructions are not taught or suggested by the cited art of record. In particular, the White patent discloses a device having a rotating shaft 1 of a rotor whose tapered ends are held between two screws 5 acting as bearings. A magnet 6 is supported by brackets 8 so that the spacing of the poles of the magnet above the opposing ends of the shaft can be adjusted. Adjusting the screws permits movement of the shaft relative to the poles of the magnet. By adjusting the spacing and the position of the shaft the weight of the ends of the shaft on the bearings can be significantly reduced.

In the White patent, therefore, the magnet is not affixed to the rotating shaft

1. Nor is there a yoke arranged with respect to the magnet, nor is the axis portion of the rotating shaft biased in the axial direction of the rotating shaft and the radial direction of the

rotating shaft by a magnetic force acting between the yoke and the magnet. Finally, there is no fitted portion of the first bearing into which the axis portion is fitted formed to have a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction or is there a fitting portion of the axis portion which is fitted into the first bearing formed to have a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction.

Applicant's amended claims 1, 7, 8 and 18, and their respective dependent claims, all of which recite such features, thus patentably distinguish over the White patent.

The Nakagishi patent discloses a galvano mirror which employs a mirror holder (rotor), a stator and magnets and coils on the stator and rotor, respectively, or vice versa. Center pins on the stator and receive members on the rotor permit the rotor to rotate relative to the stator. The stator, magnets and coils are placed so that they are symmetric with respect to the center of the rotor, i.e., have like parts above and below the center of the rotor. The patent also discloses the use of elements, such as springs, a magnet and a coil (see, for example, elements 82, 84, 88, 90, 92, 206, 223, 224, etc.) for adjusting the positions of the center pins of the stator relative to the receive members in the thrust direction so as to eliminate backlash.

The Nakagishi patent thus fails to teach or suggest the use of a yoke arranged in a position shifted in a thrust direction with respect to the magnet on a rotor. In the patent, as above-noted, the stator, magnets and coils are placed so that they symmetric with respect to the

center of the rotor. As a result, the patent also fails to teach or suggest that the axis portion of the rotor is biased in the axial direction of the rotor and in the radial direction of the rotor by a magnetic force acting between the yoke and the magnet. Finally, there is no teaching or suggestion of a fitted portion of the first bearing into which the axis portion is fitted formed to have a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction or of a fitting portion of the axis portion which is fitted into the first bearing formed to have a tapered shape so as to prevent the axis portion of the rotor from being shifted in one direction of the radial direction of the rotor at the fitted portion of the first bearing by being biased in the radial direction.

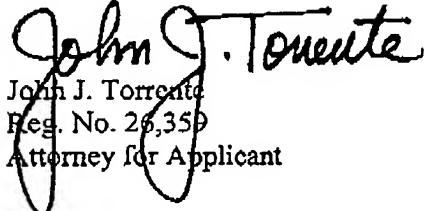
Applicant's amended claims 1, 7, 8 and 18, and their respective dependent claims, all of which recite such features, thus patentably distinguish over the Nakagishi patent. Applicant further submits that the prior art described in applicant's specification fails to add anything to the Nakagishi patent to change this conclusion.

In view of the above, it is submitted that applicant's claims, as amended, patentably distinguish over the cited art of record. Accordingly, reconsideration of the claims is respectfully requested. If the Examiner believes that an interview would expedite consideration of this Amendment or of the application, a request is made that the Examiner telephone

applicant's counsel at (212) 790-9200.

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Respectfully submitted,

  
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